543,018 COMPLETE SPECIFICATION 1 SHEET

[redacted]

FIG. 1

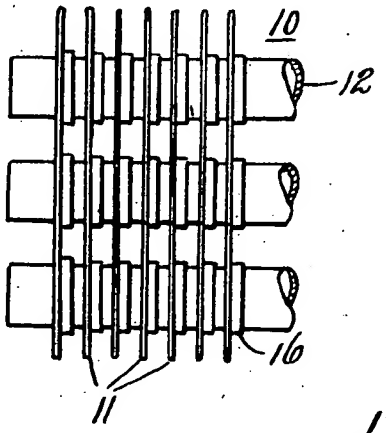
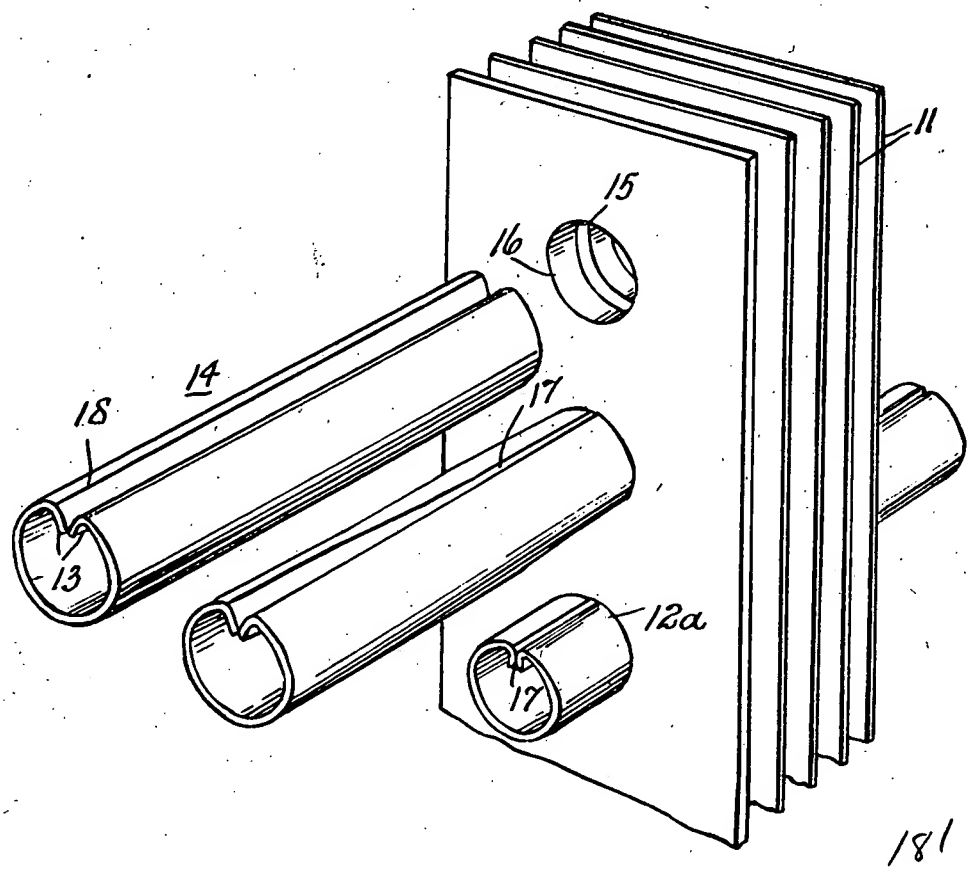


FIG. 2.



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[This Drawing is a reproduction of the Original on a reduced scale.]

Malby & Sons, Photo-Litho.

PATENT SPECIFICATION

Convention Date (United States): March 1, 1940.
Application Date (In United Kingdom): Feb. 27, 1941.
Complete Specification Accepted: Feb, 5, 1942.

543,018
No. 2657/41.

COMPLETE SPECIFICATION

Improvements in or relating to Heat Exchange Devices

We, THE BRITISH THOMSON-HOUSTON COMPANY, LIMITED, a British Company having its registered office at Crown House, Aldwych, London, W.C.2, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to heat exchangers and more particularly to heat exchangers suitable for use as condensers in connection with refrigerating apparatus and it is an object of this invention to provide a particularly sturdy construction of heat exchanger incorporating a fluid conveying conduit or tube and a simple method of manufacturing heat exchangers provided with such conduits.

In accordance with the present invention there is provided a heat exchanger embodying a fluid conveying conduit or tube formed from strip stock provided with inturned flanges at the edges thereof, the flanges being so arranged that in the assembled form of the heat exchanger the adjacent faces of the flanges lie closely adjacent each other in order to provide a seam having a large contact area, the seam being brazed in order to render the seam fluid tight.

For the construction of a heat exchanger according to the invention a simple method which furnishes good results consists in shaping a strip of sheet metal into substantially the ultimately desired form of the conduit or tube with inturned flanges extending longitudinally along opposite edges thereof, the flanges being adjacent each other thereby forming a trough, placing perforated fins over the conduit or tube, the perforations being of a size to reduce the trough and force the adjacent faces of the flanges closely together to form a seam, placing brazing material in the seam and subjecting the assembly to heat for brazing the flanges together and the fins to the conduits or tubes.

The invention will now be described with reference to the accompanying drawing in which Fig. 1 is a partial view of a heat exchanger formed according to our invention, and Fig. 2 is an enlarged perspective view illustrating a portion of a heat exchanger formed according to our invention and the method of assembly thereof.

Referring to the drawings, we have disclosed a heat exchanger 10 including a plurality of heat transferring fins 11 and a plurality of fluid conveying conduits or tubes 12 extending through suitable openings in the fins 11. The tubes or fluid conveying conduits 12 are preferably formed from flat sheet metal stock in strip form of material suitable for brazing, as mild steel, for example, if copper is the brazing material, and are formed into the desired tubular shape illustrated in the drawing by a suitable forming operation, as by drawing through a suitable die. During the shaping operation the strips of metal are provided with flanges 13 extending longitudinally along opposite sides or edges of the strips the flanges being formed to extend inwardly in the shaped form and lie adjacent each other at an angle to form a trough or depression 18. A tube formed in this manner is represented by the numeral 14 in Fig. 2.

The fins 11 are formed from relatively thin sheet material, preferably steel, and apertured as indicated by the numeral 15 to receive the tubes 12. Any suitable method may be used to form the apertures 15, such as stamping, for example. The fins 11 are preferably formed with annular collars 16 about the perforations or openings 15. The collars may be formed during the stamping operation or by any other suitable method.

For purposes of assembly, a plurality of fins are disposed in parallel relationship with openings 15 aligned in any suitable way as by means of a fixture or spacing members. Tube 12 are then passed through the openings 15 as indicated in Fig. 2, the openings 15 and collars 16 acting as dies forcing or moving the adjacent faces of the flanges 13 into close engagement over substantially the entire area of the faces as indicated by the numeral 17 in Fig. 2. Tube 12*a* in Fig. 2 illustrates a tube in its assembled form. It will be seen that the flanges 13 have been pressed closely together over the full length of the tube and the abovementioned trough has been reduced considerably. From the

above description it will be apparent that the opening 15 should be smaller than the outside diameter of the preformed tube 14 and, in fact, should be of such a size as to press the adjacent faces of the flanges 13 into close engagement on passage through the openings 15.

In order to utilize the resiliency of the conduit material for maintaining the conduits in position with respect to fins 11 and assuring good contact between conduits and fins as well as along the seam preceding and during the brazing operation, the flanges are formed at such an angle that when force is applied to move the adjacent faces of the flanges into engagement, the marginal edges of the flanges will engage first and the area of engagement will be increased progressively until substantially the entire areas are in contact. The large contact area between the flanges 13 in the assembled form of the heat exchanger provides greater strength than a butt joint and assures closer engagement between conduit and fin than with an overlapping joint. Moreover, the forming operation need not be performed as accurately as in the butt or overlapping type seam.

After assembly, the heat exchanger is brazed at a suitable temperature and in a suitable atmosphere. Inasmuch as brazing is a well known operation, full description thereof is believed unnecessary. However, we may apply any suitable brazing material to the surfaces of the collars 16 and the adjacent faces of the flanges 13, or we may pass a copper wire along the open seam indicated by the numeral 17, in which case supplemental openings must be provided in communication with the apertures 15 to permit passage of the wire. Capillary action will cause the molten brazing material to flow into the open seam for causing the contacting flange faces to be brazed securely together and also to flow between the tubes and the collars 16 in contact therewith for causing the adjoining surfaces to be brazed securely together.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A heat exchanger embodying a fluid conveying conduit or tube formed from strip stock provided with inturned flanges at the edges thereof, the flanges being so arranged that in the assembled form of the heat exchanger the adjacent faces of the flanges lie closely adjacent each other in order to provide a seam having a large contact area, the seam being brazed in order to render the seam fluid tight.

2. The method of making a heat exchanger constructed as claimed in claim 1 which consists in shaping a strip of sheet metal into substantially the ultimately desired form of the conduit or tube with inturned flanges extending longitudinally along opposite edges thereof, the flanges being adjacent each other thereby forming a trough, placing perforated fins over the conduit or tube, the perforations being of a size to reduce the trough and force the adjacent faces of the flanges closely together to form a seam, placing a brazing material in the seam and subjecting the assembly to heat for brazing the flanges together and the fins to the conduits or tubes.

3. In a heat exchanger a fluid conveying conduit and method of making the same substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 19th day of February, 1941.

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